

Appln No. 09/637,764
Amdt date March 3, 2011
Reply to Office action of September 3, 2010

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Please amend claims 1-4, 9, 12-15, 17, 18, 20, 23, 24, 28, 31-33, 35-37, 39-41, 43-46, 53-55, 58 and 59, cancel claim 29, and add claims 62-67 as follows:

1. (Thrice Amended) A rock bit comprising:
a body;
at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone;
a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising:
steel in the range of from 20 to 50 percent by weight of the hardfacing; and
filler in the range of from 50 to 80 percent by weight of the hardfacing,
the filler comprising in the range of from 10 to 100 percent by weight of the filler spherical cast tungsten carbide particles having [[a]] particle [[size]] sizes between about 16 to 40 mesh and between about 80 and 200 mesh, and tungsten carbide particles selected from the group consisting of spherical cemented, crushed cemented, crushed cast, crushed macrocrystalline, and carburized.
2. (Amended) The rock bit of claim 1 comprising filler in the range of from 60 to 75 percent by weight of the hardfacing.
3. (Amended) The rock bit of claim 1 wherein the filler comprises in the range of from 20 to 50 percent by weight of the filler spherical cast tungsten carbide particles.

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4. (Amended) The rock bit of claim 1 wherein the filler comprises in the range of from 40 to 100 percent by weight of the filler spherical cast tungsten carbide particles.
- 5-6. (Canceled)
7. (Twice Amended) The rock bit of claim [[6]] 1 wherein the filler comprises spherical cast tungsten carbide particles having [[a]] particle [[size]] sizes between about 100 to 200 mesh.
8. (Twice Amended) The rock bit of claim [[5]] 1 wherein the filler further comprises macrocrystalline tungsten carbide particles having [[a]] particle [[size]] sizes between about 40 to 80 mesh.
9. (Twice Amended) A rock bit as recited in claim 1 wherein the hardfacing comprises in the range of from 10 to 90 percent by weight of the filler spherical cast tungsten carbide particles having [[a]] particle [[size]] sizes between about 16 to 40 mesh, and further comprises ultra-fine tungsten carbide particles in the range of from 10 to 35 percent by weight of the filler [material], the particles having particle sizes in the range of from about 1 to 50 microns.
10. (Original) A rock bit as recited in claim 9 wherein the ultra-fine tungsten carbide particles are selected from the group consisting of carburized, macrocrystalline, and spherical cast.
11. (Original) A rock bit as recited in claim 9 wherein the steel in the hardfacing is dispersion strengthened by the ultra-fine tungsten carbide particles.
12. (Twice Amended) A rock bit comprising:
a body;

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at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone;

a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising:

steel in the range of from 20 to 50 percent by weight of the hardfacing;

filler in the range of from 50 to 80 percent by weight of the hardfacing,

the filler comprising in the range of from 10 to 100 percent by weight of the filler spherical cast tungsten carbide particles having [[a]] particle [[size]] sizes between about 80 to 200 mesh.

13. (Amended) The rock bit of claim 12 comprising filler in the range of from 60 to 75 percent by weight of the hardfacing.

14. (Amended) The rock bit of claim 12 wherein the filler comprises in the range of from 20 to 50 percent by weight of the filler spherical cast tungsten carbide particles.

15. (Amended) The rock bit of claim 12 wherein the filler comprises in the range of from 40 to 100 percent by weight of the filler spherical cast tungsten carbide particles.

16. (Amended) The rock bit of claim 12 wherein the filler comprises spherical cast tungsten carbide particles having [[a]] particle [[size]] sizes between about 100 to 200 mesh.

17. (Amended) The rock bit of claim 12 wherein the filler comprises in the range of from 10 to 99 percent by weight of the filler spherical cast tungsten carbide particles having [[a]] particle [[size]] sizes between about 80 to 200 mesh, and further comprises spherical cast tungsten carbide particles having [[a]] particle [[size]] sizes between about 16 to 40 mesh.

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18. (Twice Amended) The rock bit of claim 12 wherein the filler comprises in the range of from 10 to 99 percent by weight of the filler spherical cast tungsten carbide particles having ~~[[a]]~~ particle ~~[[size]]~~ sizes between about 80 to 200 mesh, and further comprises tungsten carbide particles selected from the group including spherical cemented, crushed cemented, crushed cast and crushed macrocrystalline.

19. (Amended) The rock bit of claim 18 wherein the filler further comprises macrocrystalline tungsten carbide particles having ~~[[a]]~~ particle ~~[[size]]~~ sizes between about 40 to 80 mesh.

20. (Twice Amended) A rock bit as recited in claim 12 wherein the hard-facing comprises in the range of from 10 to 90 percent by weight of the filler spherical cast tungsten carbide particles having ~~[[a]]~~ particle ~~[[size]]~~ sizes between about 80 to 200 mesh, and further comprises ultra-fine tungsten carbide particles in the range of from 10 to 35 percent by weight of the filler ~~[material]~~, the particles having a particle size in the range of from about 1 to 50 microns.

21. (Original) A rock bit as recited in claim 20 wherein the ultra-fine tungsten carbide particles are selected from the group consisting of carburized, macrocrystalline, and spherical cast.

22. (Original) A rock bit as recited in claim 20 wherein the steel in the hardfacing is dispersion strengthened by the ultra-fine tungsten carbide particles.

23. (Twice Amended) A rock bit comprising:
a body;
at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone;

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a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising:

steel in the range of from 20 to 50 percent by weight of the hardfacing;

filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising in the range of from 10 to 100 percent by weight of the filler spherical cast tungsten carbide particles having [[a]] particle [[size]] sizes between about 16 to 40 mesh and between about 80 to 200 mesh.

24. (Twice Amended) A rock bit as recited in claim 23 wherein the hard-facing comprises in the range of from 10 to 90 percent by weight of the filler spherical cast tungsten carbide particles having [[a]] particle [[size]] sizes between about 16 and 40 mesh and between about 80 to 200 mesh, and further comprises ultra-fine tungsten carbide particles in the range of from 10 to 40 percent by weight of the filler [material], the particles having [[a]] particle [[size]] sizes in the range of from about 1 to 50 microns.

25. (Original) A rock bit as recited in claim 24 wherein the ultra-fine tungsten carbide particles are selected from the group consisting of carburized, macrocrystalline, and spherical cast.

26. (Original) A rock bit as recited in claim 24 wherein the steel in the hardfacing is dispersion strengthened by the ultra-fine tungsten carbide particles.

27. (Amended) The rock bit of claim 23 wherein the filler comprises spherical cast tungsten carbide particles having [[a]] particle [[size]] sizes between about 100 to 200 mesh.

28. (New) A rock bit comprising:
a body;

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at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone; and

a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising,

steel, and

filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising in the range of from 19 to 100 percent by weight of the filler spherical cast tungsten carbide particles having particle sizes between about 16 mesh to less than 40 mesh.

29. (Canceled)

30. (Canceled)

31. (New) A rock bit as recited in claim 28, the filler further comprising spherical tungsten carbide particles having particle sizes between greater than 80 to 200 mesh.

32. (New) A rock bit comprising:

a body;

at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone; and

a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising,

steel, and

filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising in the range of from 10 to 100 percent by weight of the filler spherical cast tungsten carbide particles having particle sizes between greater than 80 mesh and 200 mesh.

33. (New) A rock bit as recited in claim 32 wherein the filler comprises in the range of from 19 to 100 percent by weight of the filler spherical cast tungsten carbide particles.

34. (Canceled)

35. (New) A rock bit as recited in claim 32, the filler further comprising spherical tungsten carbide particles having particle sizes between 16 to less than 40 mesh.

36. (New) A rock bit comprising:

a body;

at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone; and

a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising,

steel, and

filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising in the range of from 10 to 100 percent by weight of the filler spherical cast tungsten carbide particles having particle sizes between about 16 to 40 mesh and between about 80 to 200 mesh.

37. (New) A rock bit as recited in claim 36 comprising steel in the range of 20 to 50 percent by weight of the hardfacing, and wherein the spherical tungsten carbide particles have particle sizes between about 16 to less than 40 mesh and between greater than 80 to 200 mesh.

38. (Canceled)

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39. (New) A rock bit comprising:

a body;

at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone; and

a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising,

steel, and

filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising a first percent by weight of the filler of spherical cemented tungsten carbide particles and a second percent by weight of the filler of spherical cast carbide particles, wherein the first percent is greater than the second percent, wherein the second percent is at least 19 percent.

40. (New) A rock bit as recited in claim 39 wherein the filler comprises in the range of from 19 to 100 percent by weight of the filler spherical cast tungsten carbide.

41. (New) A rock bit as recited in claim 36 wherein the filler comprises in the range of from 19 to 100 percent by weight of the filler spherical cast tungsten carbide.

42. (Canceled)

43. (New) A rock bit as recited in claim 39 wherein the first percent is 70.

44. (New) A rock bit as recited in claim 43 wherein the second percent is 20.

45. (New) A rock bit as recited in claim 44, the filler further comprising 10 percent by weight of the filler carbide particles having a particle size of 30 μ m.

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46. (New) A rock bit as recited in claim 39 wherein the second percent is 20.

47. (New) A rock bit as recited in claim 43 wherein the spherical cemented tungsten carbide particles have particle sizes in the range of 28 to 35 mesh.

48. (New) A rock bit as recited in claim 47 wherein the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.

49. (New) A rock bit as recited in claim 43 wherein the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.

50. (New) A rock bit as recited in claim 39 wherein the spherical cemented tungsten carbide particles have particle sizes in the range of 28 to 35 mesh.

51. (New) A rock bit as recited in claim 50 wherein the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.

52. (New) A rock bit as recited in claim 39 wherein the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.

53. (New) A rock bit comprising:

a body;

at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone; and

a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising,

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steel, and

filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising a first percent by weight of the filler of spherical cemented tungsten carbide particles and a second percent by weight of the filler spherical cast carbide particles, wherein the second percent is greater than the first percent.

54. (New) A rock bit as recited in claim 53 wherein the first percent is 35 and the second percent is 45.

55. (New) A rock bit as recited in claim 54, the filler further comprising 20 percent by weight of the filler carbide particles having a particle size of 30 μ m.

56. (New) A rock bit as recited in claim 54 wherein the spherical cemented tungsten carbide particles have particle sizes in the range of 48 to 200 mesh and the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.

57. (New) A rock bit as recited in claim 53 wherein the spherical cemented tungsten carbide particles have particle sizes in the range of 48 to 200 mesh and the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.

58. (New) A rock bit as recited in claim 53 wherein the first percent is 40 and the second percent is 50.

59. (New) A rock bit as recited in claim 58, the filler further comprising 10 percent by weight of the filler carbide particles having a particle size of 30 μ m.

60. (New) A rock bit as recited in claim 58 wherein the spherical cemented tungsten carbide particles have particle sizes in the range of 28 to 35 mesh and the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.

61. (New) A rock bit as recited in claim 53 wherein the spherical cemented tungsten carbide particles have particle sizes in the range of 28 to 35 mesh and the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.

62. (New) A rock bit comprising:
a body;
at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone; and
a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising,
steel, and
filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising in the range of from 10 to 100 percent by weight of the filler spherical cast tungsten carbide particles having particle sizes between about 16 mesh to less than 40 mesh and spherical tungsten carbide particles having particle sizes between greater than 80 to 200 mesh.

63. (New) A rock bit comprising:
a body;
at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone; and
a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising,

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steel, and

filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising 70 percent by weight of the filler of spherical cemented tungsten carbide particles and 20 percent by weight of the filler of spherical cast carbide particles, and 10 percent by weight of the filler carbide particles having a particle size of 30 μ m.

64. (New) A rock bit comprising:

a body;

at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone; and

a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising,

steel, and

filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising a first percent by weight of the filler of spherical cemented tungsten carbide particles and a second percent by weight of the filler of spherical cast carbide particles, wherein the first percent is greater than the second percent, wherein the first weight percent is 70, wherein the spherical cemented tungsten carbide particles have particle sizes in the range of 28 to 35 mesh, and wherein the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.

65. (New) A rock bit comprising:

a body;

at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone; and

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a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising,

steel, and

filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising a first percent by weight of the filler of spherical cemented tungsten carbide particles and a second percent by weight of the filler of spherical cast carbide particles, wherein the first percent is greater than the second percent, wherein the first weight percent is 70, and wherein the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.

66. (New) A rock bit comprising:

a body;

at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone; and

a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising,

steel, and

filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising a first percent by weight of the filler of spherical cemented tungsten carbide particles and a second percent by weight of the filler of spherical cast carbide particles, wherein the first percent is greater than the second percent, wherein the spherical cemented tungsten carbide particles have particle sizes in the range of 28 to 35 mesh, and wherein the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.

67. (New) A rock bit comprising:

a body;

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at least one cutting cone rotatably mounted to an end of the body, wherein the cone includes a gage surface at a heel portion of the cone; and

a number of teeth on the cone, the teeth including a plurality of inner row teeth and a plurality of gage row teeth located near a heel of each cone, wherein the teeth include a hardfacing comprising,

steel, and

filler in the range of from 50 to 80 percent by weight of the hardfacing, the filler comprising a first percent by weight of the filler of spherical cemented tungsten carbide particles and a second percent by weight of the filler of spherical cast carbide particles, wherein the first percent is greater than the second percent, wherein the spherical cast carbide particles have a particle size in the range of 100 to 200 mesh.